SYSTEM LINE HARDENING
USING DUCTILE IRON POLES

MIPSYCON 2019 – St. Paul, MN

Marc Dray
North Region Sales Manager - McWane Poles
Warm up question #1

What year did the University of Minnesota football team last win the Big Ten Conference?

A. 1957
B. 1967
C. 1977
D. 1987
E. NEVER
Warm up question #2

How many national championships has the University of Minnesota men’s hockey team won?

A. 0
B. 3
C. 5
D. 7
E. 9
Warm up question #3

What Minnesota Vikings QB has the record for most TD passes (7) in one game?

A. Daunte Culpepper
B. Fran Tarkenton
C. Joe Kapp
D. Warren Moon
E. Rich Gannon
F. Tommy Kramer
G. Brett Favre
Aging Infrastructure

- Critical Assets such as poles are aging well beyond their design service life causing wide spread damage and outages.

- As our electrical equipment and systems get older, they are deteriorating... Causing failures and rendering our systems unable to perform as needed during periods of extreme summer and winter storms.
Infrastructure Hardening Options

- The National Electric Safety Code (NESC) is the foundation upon which many utility standards are built.
- Damage from hurricanes and wind storms has shown that building to such standards alone may suffice for normal weather, but not necessarily for some of the severe weather events resulting in some catastrophic failures and subsequent extended outages.
System Hardening using Non-Wood Poles

• Every year storms cause major outages on electric utility systems...
• How can your utility avoid problems related to aging wood poles?
• Why does your utility need to be worried about wood pole strength?
• What products are available that can reduce the risk of outages caused by downed poles?
Upgrading of Poles

• The most common hardening practice for electric T&D systems is upgrading poles and structures with stronger materials.

• This typically comprises upgrading wooden poles to steel, concrete or a composite material.

• T&D structures are typically upgraded to meet certain grade & wind loading criteria as defined by the National Electrical Safety Code.
Why is System Hardening important?
Snow & Ice Storms
High Wind Storms
Weakened poles can cause cascading failures...
Poles may appear to be acceptable until they are tested by strong storms.
Poles must be designed to handle the extra weight from joint users like phone, cable TV, and internet services.
Aging wood poles can cause long and expensive outages to occur...
Despite being an inexpensive first cost option, wood poles are susceptible to ground rot, fungus, and woodpeckers.
Most utilities are forced to have a vigorous wood pole inspection program to treat or condemn damaged poles. Unfortunately, this is an expensive process that must be repeated every few years and pole treatments only prolong required pole replacements.
Non-Wood Pole alternatives

1. Concrete (cast & spun)
2. Steel (tubular and multi-sided)
3. Fiberglass (and various composites)
4. Ductile Iron (made from recycled steel & iron)
Ductile Iron

Chemistry: Gray Cast vs. Ductile Iron
Common Uses for Ductile Iron:
Benefits of Ductile Iron Poles
Corrosion Resistance

- Natural Ductile Iron
- Weathering Steel

Graph showing the ASTM B117 Salt Fog Test:
- Weathering Steel: 1.7% of total mass after 5 weeks of exposure
- Ductile Iron: 0.6% of total mass after 5 weeks of exposure
Fire Performance Testing

Completed the following testing of their product to give their customers an understanding of how it may perform in certain situations.

Completed Studies

- Western Fire Center, Inc.
- Induron Coating Performance
- Heat Exposure Testing (In Process)
Conductivity Testing

AEP testing verifies that Ductile Iron poles are more conductive than a 4/0 copper wire.
Resistance to Mother Nature
Sustainability

Product is made of 95% Recycled Material and 100% Recyclable

Ceramic-Epoxy Embedment Coating

Wood pole treatments
Load Testing
Full Scale Test for Class 1 50’
Class 1 50’
(Pole secured @ ground line with a load applied 2’ from tip).
100% of Class 1 Load: 2.95 kips, 43 inch deflection.
130% of Class 1 Load:
3.84 kips,
58 inch deflection.
173% of Class 1 Load: 5.1 kips (prior to break), 103 inch deflection.
Product Testing Results – C1 50’

FIGURE 2
TEST RESULTS FOR 50/1
Product Support Areas

Transmission and Distribution Applications
Distribution Applications

1. Critical and asset poles (AL)
2. Storm-hardening pole (OK)
3. Replacing wood & concrete (FL)
Transmission Applications

1. N. Idaho: Rebuilt 115kV DI pole line after wild fire completely destroyed wood poles.

2. Nevada Energy: H6 80’ unguayed angle pole for 69kV & 13kV near Las Vegas, NV.

3. Central Power G&T: Rebuilt 115kV H-Frame in a protected wetland near US/Canada border near Minot, ND.
In the Field
Field Assembly

70’ and Less are Shipped Fully Assembled

Ease of Field Assembly
Installation

Lighter weight, small pole butt, easy to drill, no copper ground wire required.
Why Ductile Iron Poles?
Engineered Product

• ANSI O5.1 - Grade B
• Structural and dimensional consistency.
• High residual strength compared to wood.
• No re-tightening of hardware.
• PLS CAD library file available upon request.
Lower Life-cycle Cost

• Superior in corrosive environments.
• Impervious to rot, insects, and woodpeckers.
• Estimated life of 75-100 years.
• No environmental fees for disposal - 100% recyclable.
• Cash value when taken out of service.
Lineman Friendly

- Installed with standard equipment and hardware.
- Much easier to drill than steel or concrete – hole takes about 30 seconds to drill.
- Typically 25-30% lighter than wood.
- Pole is self grounded; so no copper required.
Weathered Finish

• Looks like wood after weathering.
• Aesthetically similar to “weathering” steel.
• Initial oxidation protects pole from further deterioration.
Coated Finish

• Arc-applied zinc, base-coat with acrylic top coat.
• Coated finish for aesthetics or extreme environments.
• Custom colors available.
Success Stories
Florida Keys

600 wood & concrete poles lost during 2017 Hurricane Irma are replaced by foreign crews with coated Ductile Iron Poles.
• 2002 ice storms brought down 16,000 wood poles.

• 2013 ice storm caused 800 wood poles to fail.

• Rebuilt 1250 miles of distribution using (4) ductile iron poles per mile.
Application Photos
55’ H1
Stigler, OK

45’ Class III
Angle Pole in TN
Riser Pole
Arapahoe, NE

Equipment Pole
Morristown, TN
40’ Class III
Waterloo, IA

65’ Class I
York, NE
50’ H1 Substation Transition
Sweetwater, TN

70’ Class III Communication Tower
Lexington, NE
Self Supporting Structure
San Angelo, TX
Extreme Coating Pole
Key Largo, FL
Goal:
Avoid costly pole maintenance and changeouts... Set a lineman friendly permanent ductile iron pole one last time!

Thank you!
Any questions?